**Date:** June 26, 2017

**Project:** 0013091150

**Subject:** **Geotechnical Comments to the LRWQCB Project Plans for Temporary Slide Repair**
Leviathan Mine
Alpine County, California

## INTRODUCTION

This memorandum presents geotechnical comments to the Lahontan Regional Water Quality Control Board's (LRWQCB) June 15, 2017 Leviathan Mine Project Plans for the Lower Pond 3 Road Temporary Slide Repair, Alpine County, California prepared by AECOM.

### Stability of Temporary Cuts and Stability After Construction is Complete

- No stability analyses have been presented to support the AECOM design. Has the designer performed stability analyses, and what were the basic material characterization assumptions and groundwater levels to develop the design?
- Sheet C102 shows the ¼ ton rock extending approximately 50 horizontal feet up slope from the road. If it hasn't already been done, a stability analysis should be completed to verify the additional ¼ ton rock material extending up the slope is not adding driving force and decreasing the stability of the slump.
- The temporary cuts necessary to complete the road re-grade (Sheet C502), 1/4-ton rock slope protection (Sheet C102), and the ½" crushed rock section (Step 3, Sheet C504) pose a significant risk of increased slope movement during construction as unloading occurs at the toe of the slump. What is the designer's plan to mitigate the risk of increasing the slope movement due to excavation near the toe (such as excavating and constructing in slots to balance loading and unloading, etc.)?
- The temporary plans only address the stability of the lower slump. It is likely that the larger slope movement could be re-activated by precipitation in winter 2017-2018. What is the designer's plan for initiating stabilization measures for the larger slope movement area?

### Surface Water Control, Drainage, and Subdrains

- The design includes installation of a perforated subdrain, which will collect, convey, and discharge near-surface groundwater to the Leviathan Creek concrete-lined channel. Has there been an assessment of the estimated discharge rate from this subdrain, either under current high water-table conditions or under a normal water-year scenario? The design includes a "T-valve" on the subdrain line approximately 15' from the terminal end. Under what circumstances does the LRWQCB expect to maintain this valve in the open and closed positions?

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- A general comment/concern on the design is that surface water should be directed away from subdrains and prevented from infiltrating into the subsurface as much as possible.
  - Sheet C504 – Step 3 specifies a zone of ½" crushed rock on the upslope side of the main subdrain, while step 6 shows the toe of a large zone of ¼ ton rock close to the ½" crushed rock section from Step 3. Given that the ¼ ton rock will be free draining, how will the design prevent surface water from precipitation events from flowing along the base of the ¼ ton rock section and into the ½" crushed rock section and/or into the ground?
  - Sheet C101 specifies that the v-ditch north and south of the slump will be re-connected across the slump mass using a subdrain and that surface drainage will be directed into the subdrain. This is a concern because if the subdrain breaks, plugs, or in any way allows surface water to enter the ground, the additional water could increase water levels and pore pressures and has the potential to contribute to further slope movements. The designer should consider keeping surface water above the ground surface and routing surface water away from the slope movement area as much as possible.
  - Sheet C102 indicates the subdrain leading from the toe of the slope to Leviathan Creek and references subdrain detail (D3, C501). Detail C3, C501 specifies a 6-inch pipe, perforated on the bottom and placed within a 3-foot wide trench backfilled with ½ crushed rock. This is a concern as it would be very difficult to abandon as it will create a short circuit for water migrating to the creek. The designer should consider increasing the setback distance from the Leviathan Creek channel, where within the setback area the subdrain is a solid pipe with lower permeability trench backfill.
  - Sheet C501 – detail D2 indicates 6-inch solid pipe on the upslope portion of the valve box which is inconsistent with Sheet C102 and referenced subdrain detail D3, C501.
  - The design should include re-contouring the ground surface on the lower pond 3 Service Road around the toe of the slump to reduce surface water ponding and infiltration.
- Sheet C101 specifies visqueen to line the upper Pond 3 Service Road v-ditch and sheet C503 specifies a "blanket" to be anchored and stapled into the ground. What is the "blanket" material? Also, we recommend using a more durable material impermeable material than visqueen to line the v-ditch, such as a geomembrane liner.

**General**

- What is the limit of the tension crack excavation and repair?
- Under the current wet and/or saturated soil conditions, the proposed excavation and construction activities will likely be difficult to complete and may present significant danger to workers, equipment, and facilities. In addition, the open excavations necessary to implement the design at the slump toe could potentially destabilize the immediate slope area. These risks should be accounted for and mitigated in the designers staging of the excavations and construction.

- Any excavation area should be thoroughly inspected for tension cracks, ground deformation features, and water entering the excavation prior to and during any work conducted around an excavation area. Workers should not enter excavations.
- The designer should consider developing a dewatering plan for the area which would require delays in the construction progress until the area can be completely dried out prior to installation of the piping and excavation of slide materials.
- Heavy dozers or compaction equipment could sink into the slide debris, and compaction equipment may also create excess porewater pressures within the slide area and may reactivate the smaller slide area. The use of vibratory compaction equipment is not recommended.
- The slope should be monitored during construction using a combination of survey monuments and measurements and observations of changes in ground deformation features and groundwater and surface water seepage, ponding, and flows. Indications of increased slope movement should be reported to the design and construction companies so that appropriate measures may be taken to ensure worker safety. In addition, spotters with continuous radio communication to the operators should be vigilant for any slope deformation during construction.